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Sexually Related Behaviors as Predictors of HPV Vaccination Among Young Rural Women

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Abstract

Purpose—To explore whether sexually related behaviors predict refusal of the human papillomavirus (HPV) vaccine among a sample of women aged 18–26 in Appalachian Kentucky.

Methods—Using a convenience sample, young women attending health clinics and a community college in southeastern Kentucky were recruited to participate in a Women's Health Study. After completing a questionnaire, women received a free voucher for the three-dose HPV vaccine series. Completion of dose one served as the outcome variable.

Results—Women with a history of an abnormal Pap test were almost two times more likely to decline the HPV vaccine (adjusted odds ratio [AOR] 1.91, 95% confidence interval [CI] 1.14–3.20, $p = 0.015$), and women who reported they had never had a Pap test were four times more likely to decline the vaccine (AOR 4.02, 95% CI 1.13–14.32, $p = 0.032$). Women engaging in mutual masturbation were nearly two times more likely to decline the free vaccine (AOR 1.91, 95% CI 1.17–3.10, $p = 0.009$). Use of hormonal birth control showed a protective effect against refusal of the free HPV vaccine (AOR 0.593, 95% CI 0.44–0.80, p = 0.001).

Conclusions—Among this sample of Appalachian women, those engaging in behaviors that increase their risk for HPV infection were more likely to refuse the vaccine. Conversely, those women engaging in protective health behaviors were more likely to accept the vaccine. These findings suggest that those women not being vaccinated may be the very group most likely to benefit from vaccination. Cervical cancer prevention programs need to be creative in efforts to reach young women most in need of the vaccine based on a higher profile of sexually related behaviors and the proxy measure of this risk (having an abnormal Pap test result).

Introduction

In recent years, prevention of cervical cancer through vaccination against human papillomavirus (HPV) infection has been an important focal point in public health and cancer control. To date, two vaccines have been developed: Gardasil, a quadrivalent vaccine (Merck), and Cervarix, a bivalent vaccine (GlaxoSmithKline). Both vaccines protect against

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Disclosure Statement

The authors have no conflicts of interest to report.

HPV infection, specifically types 16 and 18, the two virus types responsible for 70% of all cervical cancers.[1–3] Although the vaccines are licensed for young girls beginning at age 9 and can be given to women up to age 26, it is ideal to give the vaccine before a girl becomes sexually active.[3] Unfortunately, reported uptake rates of at least dose one of the HPV vaccine are quite low. Data from the 2010 National Immunization Survey suggest that only 49% of adolescent girls aged 13–17 have received at least dose one; 32% have received all three doses.[4] In 2009, the self-reported uptake rate among young adult women aged 19–26 was only 17%.[5] Additional community-based research suggests there may also be localized, geographic disparities in HPV vaccine uptake, with rural women having lower rates than their urban counterparts.[6]

Much of the early HPV vaccine-related research focused on a hypothetical vaccination scenario and emphasized intent and barriers to vaccinate from the perspective of parents of adolescents and healthcare providers.[7–17] More recently, several researchers have reported varying predictors of actual HPV vaccine uptake; however, many of the predictors are clinical variables commonly found in medical record reviews, including previous obstetric history, characteristics of providers, and healthcare system use.[17–19] Vanderpool et al.[20] found that perceptions of the value of vaccines and perceived pain from the HPV injection served as predictors of vaccine uptake among a sample of 18–26-year-old women living in rural Kentucky. The literature on health behaviors as predictors of HPV vaccine uptake is sparse, specifically sexually related behaviors that may put women at increased risk for HPV infection. Such behaviors as early sexual debut, not using condoms, having multiple partners, and mutual masturbation leading to skin-to-skin contact are clearly risk factors for HPV infection.[21–23] Additionally, ever being diagnosed with a sexually transmitted infection (STI) or genital warts and having an abnormal Pap test collectively serve as a profile of increased cervical cancer risk. Using hormonal or intrauterine contraception and increased frequency of physician visits suggest women's proactive approach to protecting their sexual health.

Whether or not these behaviors are associated with the protective behavior of HPV vaccination is not known. A study of college-aged women found that risky sexual behaviors, such as unprotected casual sexual intercourse and having multiple partners, are strongly related to interest in HPV vaccination but not actual uptake.[24] Another study of college women investigating intent to be vaccinated (rather than actual uptake of the vaccine) found recent sexual activity, a history of STIs, and ever having an abnormal Pap test result were each associated with more favorable intent to receive the HPV vaccine.[25] Although the findings from this study were not about sexual behaviors *per se*, it is intriguing to think that immediate sequelae of sexual behaviors (e.g., STI acquisition and abnormal Pap test results) may foster vaccine uptake.

Multiple studies addressing the question of association between sexual risk behaviors and HPV vaccine uptake will be published in the near future. The working hypothesis for these investigations may best be framed under the rubric of Problem Behavior Theory, which suggests a strong level of colinearity among risk behaviors (or the inverse, that is, strong colinearity among protective behaviors).[26] Accordingly, the purpose of this study was to test the general hypothesis that sexually related behaviors, such as sex with men and women,

condom use, mutual masturbation, contraceptive use, and history of STIs and abnormal Pap smears would predict HPV vaccine uptake. Specifically, we expected to find less uptake of the vaccine among women engaging in relatively greater levels of sexually related risk behavior. We chose to conduct the study in a medically underserved area of Appalachian Kentucky with women aged 18–26. Females in this age group are considered part of the catch-up pool of women (aged 13–26) who have not already been vaccinated.[3] It is important to understand what behavioral factors may affect vaccine uptake among this age group, considering that these women are the not the targeted recipients of mainstream HPV vaccine marketing campaigns, are no longer eligible for the Vaccines for Children program, and are often uninsured or underinsured.[27] Moreover, Appalachian Kentucky is a geographically isolated region recognized for economic distress, lower rates of cancer screening, and higher rates of cervical cancer incidence and mortality.[28–34]

Materials and Methods

Study sample

This study sample is from a region of Appalachia that contains a high number of distressed counties (42 of 54 Kentucky Appalachian designated counties), which are designated by the Appalachian Regional Commission (ARC) based on varying economic and employment indicators.[35] Many of the poorest counties in the nation can be found in this region.[36] As posited by the Diffusion of Innovations Theory, knowledge of new innovations, such as the HPV vaccine, is often lower in populations that have limited formal education and lower socioeconomic status (SES) and are less urban.[37] Kentucky as a whole has lower adolescent HPV vaccination rates compared to the United States (40% at least dose one),[4] and Crosby et al.[6] found higher vaccination rates among young adult women in urban Kentucky compared to rural Kentucky. Therefore, it is reasonable to extrapolate that our study targeted a population that was clearly undervaccinated compared to national and state data.

Data collection

From March 2008 through September 2009, a research assistant recruited female patients in any of five regional health clinics located in five rural counties of Southeastern Kentucky. Age-eligible women were approached by a clinic nurse to first determine interest in participating in the study. If the women were interested, a research assistant then privately spoke with each woman to explain the study purpose and to obtain consent if she chose to participate. During that same time period, a second research assistant recruited age-eligible women attending a local community college (with buildings located in four of the same five counties used for the clinic sample). Recruitment at the community college used varying approaches, including emails, fliers, and presentations in the classroom and at college health fairs. Community college women were selected to offset what would have otherwise been a purely clinic-based sample of young women. Women were eligible if they were not pregnant, were 18–26 years old, and had not been vaccinated with Gardasil (the only HPV vaccine approved for use at the time). Of 505 eligible women, 495 (98%) agreed to participate in the study and provided written informed consent. The Institutional Review Board at the University of Kentucky approved the study protocol.

Because the HPV vaccine was not universally covered by insurance plans, it was determined that the study design would have to remove the barrier of cost to effectively identify sexual behaviors predicting uptake. However, the fact that the HPV vaccine would be provided at no cost was not advertised or disclosed until after the questionnaire was completed. To avoid self-selection bias, the project was called the Women's Health Study. Volunteers were told that "the purpose of this survey is to learn more about why women would or would not accept the HPV vaccine if it was made available to them." After providing consent, women recruited from the community college completed a self-administered questionnaire, and women recruited from the clinics completed the same questionnaire, but it was administered in an interview-assisted format. It should be mentioned that overall literacy rates in the study area are low. Although literacy was somewhat assured with the college sample, there was concern that the clinic sample might need one-on-one assistance to complete the written questionnaire. Assessments were conducted in a private or semiprivate area, with a research assistant being available to read words or entire questions on the self-administered questionnaire if needed. Women were compensated with a $25 gift card for their time, and the research assistant provided women with an HPV vaccine educational pamphlet and a voucher to receive all three doses of the HPV vaccine free of charge at the clinic they were recruited from or, in the case of college women, at a centrally located clinic. These vouchers were coded with an ID number that matched the ID number recorded on women's questionnaires, and women had 30 days to receive dose one, after which they became ineligible to receive the free vaccine. To ensure the accuracy of those receiving dose one, a database of those eligible to receive the HPV vaccine was created, and clinic nurses were given access to ensure the correct study participants were redeeming vaccine vouchers. The number of women redeeming the voucher for the initial dose of vaccine served as the study outcome variable.

Measures

The questionnaire was refined based on experiences in a previous study.[25] The survey began with a brief paragraph about HPV, its relationship with cervical cancer, and the HPV vaccine. There were three questions that specifically assessed women's sexual behaviors. The first question asked, "In the past 12 months, have you had sex?" with response options of yes or no. If women answered yes to this question, they were then asked, "With how many men?" and given an opportunity to answer with a number. Respondents who answered yes to this first question were also asked, "Please think about the last 5 times you have had sex (penis in vagina) with a man. Of these 5 times, how many times was a condom used from start to finish of sex?" with response options of 0–5 to select from. The second sexual behavior question asked, "HPV can be spread by skin to skin contact; therefore, in the past 12 months, have you had sex with women?" with response options of yes or no. If participants answered yes, they were asked, "With how many women?" The third question asked, "Because HPV can be spread by skin to skin contact, sex is not the only way to get the virus. In the past 12 months have you ever engaged in mutual masturbation with a partner? (this means that you each used fingers and hands to touch and arouse the other person's genitals)" with response options of yes or no. If participants answered yes, they were then asked, "About how often in a typical month did you engage in mutual masturbation?" with response options of once a month or less, about twice each month, 3 to

5 times each month, and at least 6 times each month. The survey included one question pertaining to relationship status: “Which statement best describes your current or most recent relationship status?” The response options included: “We have a deep commitment to each other,” “We see each other exclusively, but the commitment is not necessarily long term,” and “We have agreed that our relationship is only temporary.”

The next set of questions assessed women’s past gynecologic history, and each had response options of yes or no. (1)”Have you ever had a family member or close friend tell you that she had cervical cancer?” (2) “Have you ever been told by a doctor or nurse that you have cancer?” (3) “Have you ever had a Pap test?—If yes, about how many times have you had a Pap test in your life?” with response options of 1 time up to five or more times. (4) “Have you ever been told by a medical professional that you have an abnormal result on a Pap test?” (5) “Are you currently using hormonal contraceptives?” (6) “Are you currently using an intrauterine device (IUD) to prevent pregnancy?” (7) “Have you ever been told by a medical professional that you have a sexually transmitted disease?” (8) “Have you ever been told by a medical professional that you have genital warts?” (9) Have you ever been told by a medical professional that you have human papillomavirus (HPV)?” The survey contained one question that served as a measurement of interaction with the healthcare system: “In the past 12 months, about how many times have you gone to see a medical doctor?” with response options ranging from zero through five or more times.

Statistical analysis

Bivariate associations were measured by prevalence ratios, 95% confidence intervals (CI), and *p* values. The variables that achieved significance at the $\alpha = 0.05$ level were included in the logistic regression model. At the bivariate level, categorical variables were assessed using chi-square and, when appropriate for small cell sizes, Fisher’s exact test. Continuous variables were assessed using *t* tests.

A hierarchical logistic regression with a forward Wald approach was used for the multivariate analysis. This model controlled for (1) age, (2) ever having a Pap test, (3) ever having an abnormal Pap test, and (4) doctor visits. Sexually related behaviors included in the model were mutual masturbation, intrauterine contraception use, hormonal contraception use, and condom use. All statistical analysis was performed with SPSS version 18.

Results

Characteristics of sample

Table 1 displays the characteristics of the sample. The average age of the sample ($n = 495$) was 21.56 years (standard deviation [SD] 2.50). The majority of the women identified themselves as Caucasian (98.0%). A large portion of the sample (88%) reported their home county as rural as determined by the Rural-Urban Commuting Area Codes (RUCA).[38] The majority of the women reported having participated in sex with men in the past 12 months (86%); of these women, 16.7% reported having two or more male partners. Almost half of the sample (47%) did not use condoms for the past five sexual encounters with males. The majority of the sample (85%) identified their most recent love relationship as a deep

commitment to one another; the rest described their relationship as either exclusive, yet not long term, or temporary. Over 50% of the women reported participating in mutual masturbation in the past 12 months. Almost half of the sample reported hormonal birth control (49.2%) use, and only 19% of the sample reported IUD use for birth control. Furthermore, 24% reported an abnormal Pap test in their gynecologic history. Only 128 (26%) of the women received dose one of the HPV vaccine within the allotted 30-day window. Adherence to doses two and three was extremely low, limiting subsequent analysis; results have been presented elsewhere.[6]

Bivariate associations

Table 2 displays the significant bivariate findings. After examining the data for interaction by study site, three variables were found to have interaction at the bivariate level: condom use and hormonal and intrauterine birth control use. Condom use was significantly associated with vaccine uptake ($p = 0.011$). Women who did not use condoms were more likely to refuse dose one of the HPV vaccine. However, this association was moderated by recruitment site; the association applied only to clinic-recruited women. Among these women, 62.4% of those not using condoms declined the free vaccine compared to 44.0% of those using condoms ($p = 0.009$). In contrast, among college-recruited women, 95.1% of those not using condoms declined the free vaccine compared to 92.0% of those using condoms ($p = 0.36$).

Ever having a Pap test was also significantly associated with uptake of the vaccine ($p = 0.005$). Women who had never had a Pap test were more likely to refuse dose one of the HPV vaccine. Specifically, among those never having a Pap test, 88.1% declined the free vaccine compared to 71.9% among those ever having a Pap test. Because of an empty cell in the contingency table analysis, a test for moderating effects could not be conducted for this variable.

Hormonal birth control was significantly associated with uptake ($p = 0.010$). Women who did not use hormonal birth control were more likely to decline the vaccine compared to those currently using a hormonal method. Again, this association was moderated by recruitment site and applied only to clinic-recruited women. Among these women, 63.1% of those not using hormonal contraception declined compared to 47.6% of those using condoms ($p = 0.014$). Among college-recruited women, 94.5% of those not using hormonal contraception declined compared to 91.5% of those using hormonal contraception ($p = 0.35$).

Intrauterine birth control was also significantly associated with vaccine uptake ($p = 0.030$). Women who did not use an IUD were more likely to decline dose one of the HPV vaccine. Once again, the association was moderated by site; however, in this case, it applied only to college-recruited women. Among these women, 96.9% of those not using an IUD declined the free vaccine compared to 78.4% of those using an IUD ($p = 0.0001$). In contrast, among clinic-recruited women, 56.6% of those not using an IUD declined the free vaccine compared to 48.8% of those using an IUD ($p = 0.36$).

Mutual masturbation was significantly associated with uptake ($p = 0.006$). Women who engaged in mutual masturbation were more likely to decline regardless of recruitment site. Doctor visits was significantly associated with uptake ($p = 0.036$). Women who had not been to the doctor in the past 12 months were more likely to decline regardless of recruitment site. Finally, ever having an abnormal Pap test result was significantly associated with lower uptake ($p = 0.001$). Women reporting they had an abnormal result were more likely to decline regardless of recruitment site.

Multivariate associations

Table 3 displays the four predictor variables that retained significance at the multivariate level. The model controlled for the following variables: age, ever having a Pap test, ever having an abnormal Pap test, and frequency of doctor visits in the past 12 months. To control for confounding due to recruitment site, those variables found to be significant with interaction at the bivariate level were used in the model with an interaction term (recruitment site). Women with a history of an abnormal Pap test result were nearly two times more likely to decline the vaccine (adjusted odds ratio [AOR] 1.91, 95% CI 1.14–3.20, $p = 0.015$), and women reporting they had never had a Pap test were four times more likely to decline the vaccine (AOR 4.02, 95% CI 1.13–14.32, $p = 0.032$). Women engaging in mutual masturbation were nearly two times more likely to decline the free vaccine (AOR 1.91, 95% CI 1.17–3.10, $p = 0.009$). Use of hormonal birth control showed a protective effect against refusal of the free HPV vaccine (AOR 0.593, 95% CI 0.44–0.80, $p = 0.001$). The following variables were not significant predictors of HPV vaccination refusal: intrauterine birth control use (AOR 0.702, 95% CI 0.49–1.01, $p = 0.056$) and doctor visits (AOR 0.260, 95% CI 0.06–1.22, $p = 0.088$).

Discussion

Considering that the HPV vaccine can effectively prevent cervical precancerous and cancerous lesions, low uptake of HPV vaccination among young women is a missed opportunity in public health practice. This is particularly true in communities experiencing elevated rates of cervical cancer incidence and mortality, such as Appalachian Kentucky. Our findings suggest that overall uptake rates are low (26%) among 18–26-year-old women despite the vaccine being offered free. Moreover, our results support the Problem Behavior Theory and the grouping of similar behaviors, whether risky or protective in nature.[26]

In essence, we found that young women's sexually related behaviors cluster with their uptake of the HPV vaccine. Specifically, those young women engaging in sexual behaviors that increase their risk of HPV infection and cervical cancer were more likely to be the same young women who declined the vaccine. For example, women who engage in mutual masturbation, a sexual behavior that can spread HPV through skin to skin contact, were more likely to refuse free HPV vaccine. Similarly, women reporting a history of an abnormal Pap test and never having a Pap test were more likely to decline vaccination. The reverse scenario is also true: young women who engage in relatively less sexual risk behaviors are the ones more likely to accept the HPV vaccine. Although some people may view this finding as counterintuitive, it clearly suggests that women who engage in

protective sexual behaviors are more apt to continue this line of behavior in a healthcare-related setting. We found that young women who have had at least one Pap test, who have not had an abnormal Pap test result, and who do not engage in mutual masturbation were all more likely to accept our offer of free HPV vaccination. The protective effect of hormonal birth control use is possible for two reasons. First, these women routinely interface with the healthcare system and may find ease in obtaining needed health services, including HPV vaccination. Second, in most instances, these women are proactively taking steps to prevent pregnancy and may have a strong inclination to also protect themselves against HPV infection and cervical cancer. This further demonstrates our behavior clustering hypothesis.

The findings are limited by the use of a convenience sample and the validity of the self-reported data pertaining to sexual and gynecologic history, as well as possible sample bias based on the recruitment strategy, which did not allow us to track the number of women approached for participation. Our sample is further limited in that it does not focus on younger adolescent girls who are also eligible for the HPV vaccine; however, the choice to focus on the catch-up pool of women was deliberate and relevant for the geographic area of study. Additionally, findings may be limited by differential data collection methods that were necessary for the study population. It is worth noting that our use of coded vouchers to collect the primary outcome variable (i.e., vaccine uptake) is a clear asset to the rigor of this study, as is the focus on a medically underserved population.

Conclusions

These exploratory findings provide an important image of what may be occurring with respect to public health efforts to promote the HPV vaccine to young women, aged 18–26. It is possible that those most at risk of HPV acquisition also have the least proclivity to be vaccinated against this STI. The ramifications of this possible occurrence are 2-fold. First, those not being vaccinated may be the very women most likely to benefit from the vaccine. Second, cervical cancer prevention programs need to be more creative in efforts to reach young women most in need of the vaccine based on a higher profile of sexually related risk behaviors and the proxy measure of this risk (having an abnormal Pap test result). According to recommendations, vaccinating all young women against HPV infection is important; however, healthcare providers and public health practitioners may consider prioritizing those women who engage in higher rates of risky sexual behavior and are less likely to seek out protective health services on their own. Further research should explore other possible explanations for the pattern of results that support or refute the Problem Behavior Theory.

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Table 1

Characteristics of Study Sample, Appalachian Kentucky Women, Aged 18–26

Variable	Mean (SD)	*n* (%)
Age	21.56 (2.50)	495
Race		
Caucasian		485 (98.0%)
Sex with men in past 12 months		
Yes		418 (85.7%)
No		70 (14.3%)
Number of male partners		
At least one		345 (83.3%)
Two or more		69 (16.7%)
Condom use with men		
0		195 (46.8%)
≥1		222 (53.2%)
Sex with women in past 12 months[a]		21 (4.3%)
Number of women partners		
At least 1		11 (47.8%)
≥2		12 (52.2%)
Mutual masturbation in past 12 months[a]		249 (51.9%)
Family member or friend with cervical cancer[a]		188 (38.0%)
Ever had cancer[a]		10 (2.0%)
Currently using hormonal contraception[a]		242 (49.2%)
Currently using intrauterine device[a]		92 (18.7%)
Ever had STI[a]		27 (5.5%)
Ever had genital warts[a]		9 (1.8%)
Ever had HPV[a]		42 (8.5%)
Ever had Pap test[a]		427 (86.4%)
Ever had abnormal Pap test result[a]		118 (23.9%)
Relationship		
Not committed		69 (15.4%)
Committed		380 (84.6%)
Number of doctor visits in past 12 months		
Never		468 (94.7%)
At least one or more		26 (5.3%)

[a]Only reporting “yes” response.

HPV, human papillomavirus; SD, standard deviation; STI, sexually transmitted infection.

Table 2

Bivariate Associations Predicting Refusal of Dose One of HPV Vaccine

Variable	*n* (%)	PR	95 % CI	p
Mutual masturbation				
Yes	197 (79.1%)	1.16	1.04–1.30	0.006
No	157 (68.0%)			
Doctor visits in past 12 months				
None	342 (73.1%)	0.79	0.70–0.90	0.036
At least one (up to five)	24 (92.3%)			
Ever had a Pap test				
Yes	307 (71.9%)	1.23	1.10–1.36	0.005
No	59 (88.1%)			
Ever had abnormal Pap test				
Yes	74 (62.7%)	1.24	1.07–1.44	0.001
No	292 (77.7%)			
Currently using hormonal contraception[a]				
Yes: Clinic	59 (47.6%)	1.33	1.06–1.67	0.014
No: Clinic	77 (63.1%)			
Yes: Community college	108 (91.5%)	1.03	0.96–1.11	0.353
No: Community college	121 (94.5%)			
Currently using intrauterine contraception [a]				
Yes: Clinic	20 (48.8%)	1.16	0.83–1.62	0.359
No: Clinic	116 (56.6%)			
Yes: Community college	40 (78.4%)	1.24	1.07–1.43	0.0001
No: Community college	188 (96.9%)			
Condom use with men in past 12 months[a]				
0: Clinic	58 (62.4%)	1.42	1.09–1.84	0.009
≥ 1: Clinic	48 (44%)			
0: Community college	97 (95.1%)	1.03	0.96–1.12	0.363
≥ 1: Community college	104 (92.0%)			

[a]Variables with interaction presented by recruitment site.

CI, confidence interval; PR, prevalence ratio.

Table 3

Multivariate Associations Predicting Refusal of Dose One of HPV Vaccine (n = 495)

Variable	AOR	95% CI	*p*
Abnormal Pap test	1.91	1.14–3.20	0.015
Ever had Pap test	4.02	1.13–14.32	0.032
Mutual masturbation	1.91	1.17–3.10	0.009
Hormonal birth control use	0.593	0.44–0.80	0.001

AOR, adjusted odds ratio.